



**Office of Prevention, Pesticides,  
and Toxic Substances**

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**MEMORANDUM**

**DATE:** June 17, 2002

**SUBJECT:** Qualitative Assessment of Long-range Transport and Atmospheric Deposition of Lindane to Great Lakes

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This memo presents the qualitative assessment of long-range transport and atmospheric deposition of lindane to the Great Lakes. The following qualitative assessment is based on current literature available at the present time.

**ASSESSMENT: LINDANE IN THE GREAT LAKES**

The ubiquitous presence of lindane in atmosphere, natural water bodies, soils, and sediments of the Great Lakes regions implies redeposition of lindane from secondary emissions and long-range transport of lindane from agricultural and industrial sites. There is very limited information available to link lindane loading from global, regional, or local sources to Great Lakes. Strachan (1985) estimated 290 kg/yr of lindane and 860 kg/yr of  $\alpha$ -HCH loading from precipitation to Lake Superior. Since 1983, Environment Canada is measuring the deposit of toxic contaminants from the atmosphere to the Canadian side of the Great Lakes basin. Williams et al. (1998) reported that the deposition of lindane from precipitation has not changed since 1990. They also observed a seasonal pattern of increased lindane concentrations during spring and summer, which suggests that agricultural activities during that time may have been causing

temporal increases of lindane concentration. Reported concentrations of water samples from the channels of Great Lakes are very similar throughout the Great Lakes suggest that the atmosphere is the predominant source of lindane. Elevated concentrations in Lake Erie suggest that regional source may have been contributing as well.

There are increasing national and international efforts to assess the atmospheric transport and deposition of toxic substances to the Great Lakes. The Integrated Atmospheric Deposition Network (IADN) was established in 1990 by the United States and Canada for conducting air and precipitation monitoring in the Great Lakes Basin to determine the magnitude and trends of atmospheric loadings of toxic contaminants. IADN maintains monitoring stations on each of the Great Lakes to monitor atmospheric deposition of selected pollutants. IADN incorporates wet deposition, dry deposition, and net gas exchange atmospheric deposition processes into its loading estimates. The temporal regional flows for both  $\alpha$ -HCH and lindane ( $\gamma$ -HCH) are presented in Figure 1, which shows that  $\alpha$ -HCH significantly decreased across the Great Lakes basin and has a net volatilization for the first time in 1998. In contrast, the flows for lindane remain relatively stable since their decrease in 1995 due to restricted use of lindane and the ban of  $\alpha$ -HCH, which also contain 10–18% of  $\gamma$ -HCH isomer (USEPA, 1998).

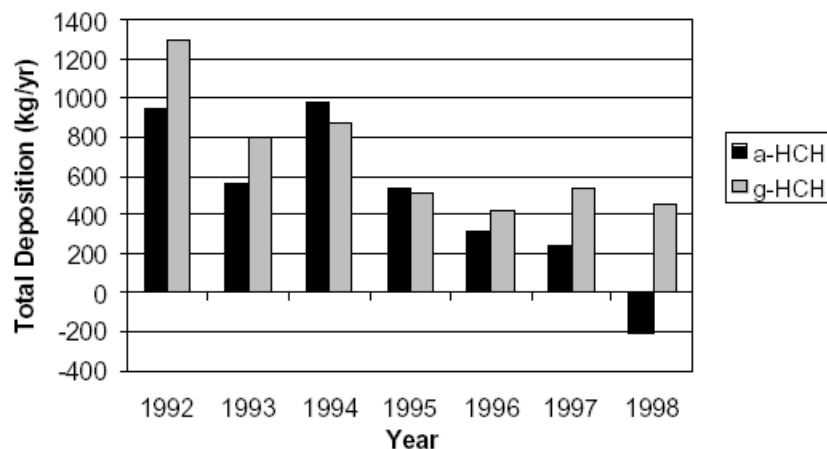


Figure 1. Total flows of  $\alpha$ -HCH and  $\gamma$ -HCH over all Great Lakes  
(Sources: [www.epa.gov/glnpo/iadn/resources-1998](http://www.epa.gov/glnpo/iadn/resources-1998))

Considerable progress has been made in monitoring and assessing the loading of lindane and many other toxic contaminants for the Great Lakes regions. The importance of long-range transport and atmospheric deposition of toxic contaminants into the Great Lakes and their effects on the chronic exposers of human, terrestrial, and aquatic organisms are only the beginning to be understood. Therefore, continuing long-term monitoring programs and the evaluation of pertinent

data will help the scientists and regulatory authorities to develop preventive measures in reducing or eliminating the toxic contaminants to Great Lakes.

**References:**

Strachan, W.M.J. 1985. Organic substances in the rainfall of Lake Superior: 1983. J. Environ. Toxicol. Chem. 4:677-683.

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Williams, D.J., K.W. Kuntz, S. L'Italien, and V. Recardson. 1998. Lake Ontario surveillance program: spatial and temporal trends of selected parameters with emphasis on 1992-93 results. Environment Canada, Ecosystem Health Division Report 98-01/I.